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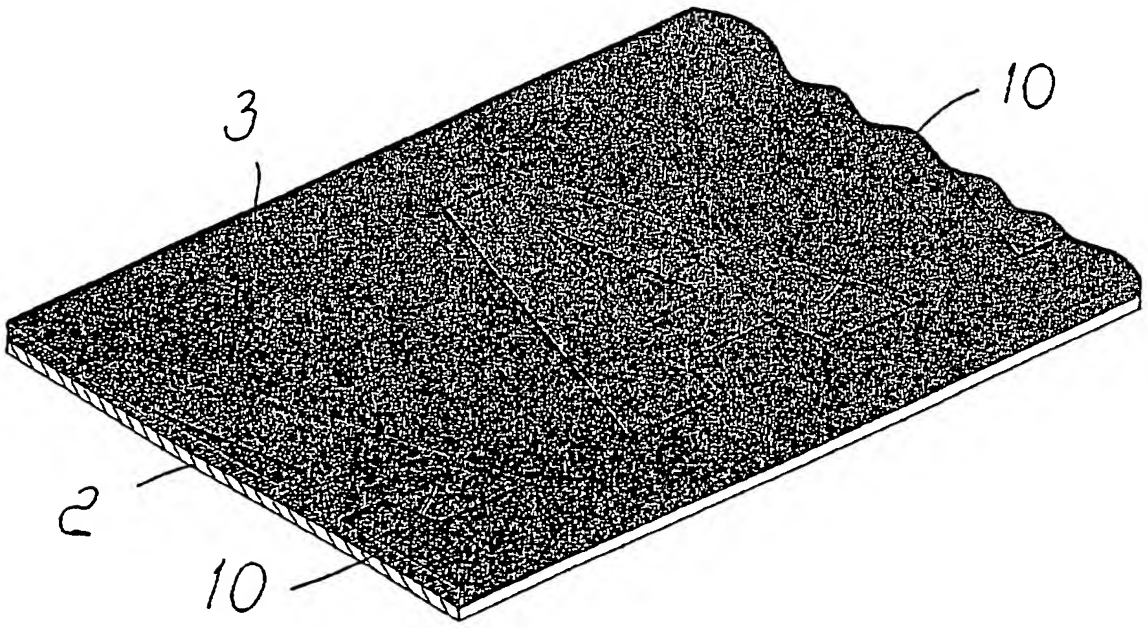
(54) Title: SECURITY ELEMENT FOR DOCUMENTS IN GENERAL AND IN PARTICULAR BANKNOTES, SECURITY CARDS AND THE LIKE




(57) Abstract: Security element (1) for documents in general, in particular banknotes, security cards and the like, comprising a support layer (2) having, at least on one face, a continuous layer of metallic material (3), wherein said continuous layer of metallic material (3) comprises at least one zone (10) having a reduced thickness of metal with respect to surrounding portions so as to be visually distinctive from the surrounding portions or vice versa.



WO 2004/014665 A1

# Security element for documents in general and in particular banknotes, security cards and the like

The present invention relates to a security element for documents in general and in particular banknotes, security cards and the like.

As it is known, in order to avoid the counterfeiting of banknotes and documents in general, a presently very used technique consists in arranging some threads which can be inserted into the mixture of the paper of which the document is made, said threads being wholly inserted or partially fitted-in the paper, that is, having some parts inside and some parts outside of the paper.

Typically, these threads are made of a support layer of flexible and transparent plastic material upon which metallic layers, magnetic elements, microprintings, fluorescent elements, magnetic codes and so on are deposited.

To also allow the public and the common users to verify the authenticity of the documents, threads have been developed which allow the immediate and easy determination of the authenticity of the threads, together with the possibility to carry out the control through automatic devices which are suitably arranged for this purpose.

One of these threads is illustrated in the European patent EP-0 319 157 which is substantially made of a layer of transparent and flexible plastic material upon which a vacuum-deposited aluminium layer is applied, upon which some zones, areas, texts or graphic signs are realised by means of demetallization that creates some zones without the metal, but they are entirely surrounded by metal that allows to keep the metallic continuity of the thread.

This present kind of solution results in easily falsificating because it is possible to utilise transfer materials like materials which are printable on support which can be removed and positioned on other supports by means of the use of particularly precise dies manufactured by laser techniques.

Furthermore, another easy possibility of counterfeiting derives from the use of usual polyester sheets metallized under vacuum, that are available on the market, from which the aluminium can be removed, for example, by means of an Nd-Yag laser ray with a wavelength around 100 nm that is with an equipment which is easily available.

Another problem is constituted by the fact that in the solution described above, the different graphic signs are obtained by realising a complete removal of the metal, thereby causing in some cases, during the phase of lengthening of the threads which inevitably occurs at the time of its insertion into the paper, a break of the metallic layer around the cut zones which can strongly compromise the metallic continuity of the ensemble.

Another problem is constituted by the fact that, at the time of the insertion of the thread into the paper, the thread is submitted to an acid environment or anyway aggressive agent which determines some corrosion especially in the zones of the corners which are obtained by demetallizing completely the thread.

This fact causes both a degradation during the service-life of the product, and a possible difficulty in reading and checking of the thread or security element.

The object of the present invention is to eliminate the formerly described drawbacks, realising a security element for documents in general and in particular banknotes, security cards and the like, which gives the possibility to create an ensemble which is

not reproducible with traditional techniques and, consequently, disposable by the possible counterfeiter.

Within the object described above, a particular object of the invention is to manufacture a security element which doe not eliminate the metallic continuity on the whole surface of the support layer, thereby preventing any possible break, for example at the time of lengthening of the thread for the insertion into the paper, thereby maintaining in any condition the metallic continuity which is necessary for the detection of the security element by means of a reading equipment.

A further object of the present invention is to manufacture a security element which is not subject to damage also in the case in which it is attacked in an acid environment, which is the typical environment at the time of the insertion of the thread into the paper, thereby maintaining constant its integrity in time.

A further object of the present invention is to manufacture a security element which is applicable externally to the document, thereby creating a feature easily perceptible by the public.

The above object, as well as the further objects briefly mentioned and others which will be apparent in the following, are achieved by a security element for documents in general and in particular banknotes, security cards and the like according to the invention which comprises a flexible support layer having, on at least one of its faces, a layer of metallic material, characterised in that said layer of metallic material comprises at least one zone having a metal thickness lower than 60% of the thickness of the layer of metallic material of the surrounding portions.

Further characteristics and advantages will become apparent from the description of one preferred embodiment, but not exclusive,

of a security element for documents in general and in particular banknotes, illustrated by purely a non limitative example, with reference to the attached drawings in which:

- figure 1 schematically shows the security element according to the invention;

- figure 2 represents the security element in an greatly enlarged scale and in cross-section;

- figure 3 represents the security element according to the invention inserted into a document;

- figure 4 represents the security element applied on the external face of the document.

With reference to the drawings, the security element for documents in general and in particular banknotes, security cards and the like according to the invention, which is indicated in its entirety with the reference number 1, comprises a flexible support layer 2 which is advantageously obtained by polyester sheets and the like.

On the support layer 2, upon one face but possibly also on both faces, a layer of metallic material 3 is provided, wherein the important peculiarity are zones, indicated with 10, which have a reduced thickness of the metal with respect to the surrounding zones and which is preferably, lower than 70% and greater than 25% of the thickness of the layer of metallic material of the surrounding portions; hence, with a thickness of the layer of 1,8 Optical Density, the zones of reduced thickness must have a thickness comprised between 0.45 and 1.26 Optical Density.

In this way the metallic continuity is maintained on the whole surface of the support layer, and the distinctive elements which can be constituted by characters, graphical signs and anything

else which can be considered as being suitable, are defined in practise by said zones having reduced thickness of the metal.

The metallic layer can be obtained of aluminium being metallized under vacuum or other metal like chrome, nickel, copper or a combination of these materials.

The partial removal allows to maintain the metallic continuity having as well a different amount of metal among the zones where the partial removal has been effected which allows to keep an element visually verifiable.

The support layer can be made of a tape, as shown in the specific example, but, obviously, it can assume any other configuration as thread, stamp or any other configuration which is deemed to be suitable.

The security element manufactured, as disclosed above, can either be wholly inserted into the paper of which the document is made, or partially inserted, that is, having some part that come out of the surface, or directly applied on the surface like schematically illustrated in figure 4.

In a specific embodiment, the support layer is made of 15, 19 or 23 μm polyester which is metallized on its side by means of a vacuum metallizer, which deposits an aluminium layer of 1.8 Optical Density.

A cleaner film can be obtained by plasma treatment which allows a better and more uniform adhesion.

Preferably, the speed of application must not be more than 400-500 metres per minute, and a metallizer should be used having an advancing system for each aluminium thread and a system of automatic detection of metallization, so that a surface with a maximum variation of thickness lower than 3% is obtained.

The tape treated as disclosed above is inserted into a chemical action demetallization device, possibly with the use of an acid.

To perform the treatment, the metallic layer is previously submitted to a corona treatment which allows to simplify the anchoring of an ink which is used.

Above the aluminium layer, a very transparent ink adapted to preserve the aluminium by the attacks of acid substances is printed with normal operations of printing, these inks are, for example, nitrocellulosic inks with the addition of a catalyst or anyway of a hardener with a percentage of 1%.

Some tanks containing the chemical products for the demetallization of the tape and a subsequent washing and drying system are provided.

A suitable method implies the metallization of a 23 µm polyester film with 1.8 Optical Density of aluminium +/- 3%, subsequently a corona treatment is performed on the metallic layer, thereby providing a superficial wettability of 54 +/- 4 dynes, subsequently the metallic layer is printed with an ink for metals, for example nitrocellulosic ink with a thickness of 1.2 - 2 µm.

The film is then passed in a tank containing 47-48% phosphoric acid with a temperature of 40°C +/- 2 for about 40 - 45 seconds.

The film is washed in a tank using water, and at the exit of the tank, the film is dipped in a tank with a buffer solution made of water and 3/5 % ammonia.

Afterwards the treated film is submitted to an abundant rinse, keeping the pH value in each tank constant.

At the exit of the last tank, the film is submitted to a gentle wringing by means of rubber rollers, and then it is passed in a hot air tunnel at the speed of 40 metres per minute and a hood temperature of about 90/100° C; the tunnel has a length of about 6 metres in such way to obtain a permanence time of about 10 seconds.

The method described above allows to obtain security threads on which the deposited aluminium has been partially removed from 1.8 Optical Density to 0.7 Optical Density in the zones in which the ink has not been applied.

Another possible solution to obtain the security element according to the invention consists in carrying out the complete demetallization in the zones where the characters, distinctive signs and the like must be printed, which is indicated by 10, and to apply afterwards a thickness of metal with a thickness lower than the thickness of the surrounding zones.

In practise, a 23 µm polyester film is metallized with 1.8 Optical Density +/- 0.3%, and subsequently, as in the previous case, corona treatment is carried out bringing the superficially wettability to 54 +/- 4 dynes, and the print is carried out on the side of the metallic layer with cellulosic inks for a thickness of 1.2 - 2 µm. The film thus obtained is passed in a tank which contains 54/56 % phosphoric acid with a temperature of 55°C degrees +/- 2 with a permanence time of about 50 - 55 seconds.

The film is then washed in a tank using water and afterwards, in another tank, it is dipped into a buffer solution with water and 3/5 % ammonia.

After an abundant rinse, the film is submitted to spraying and drying like in the previous example.

The film is subsequently submitted again to a full bottom metallization operation preferably with a thickness of 0.7 Optical Density.

The metallic layer can be possibly applied also on the opposite face.

From what is illustrated above, it can be seen that the invention reaches the proposed objects, and in particular it has been pointed out that a security element is provided which maintains a superficial metallic continuity which renders very complex counterfeiting, in addition to improving the mechanical and chemical characteristics of the ensemble by the fact that the metallic continuity prevents, in particular in the zones where the signs and distinctive characters are defined, successive breaks from occuring during the treatment phases.

The invention so conceived is susceptible of various changes and modifications all within the scope of the present invention.

To what illustrated above, it must be added that the ratio between the surfaces with reduced thickness and the surfaces with total thickness could be changed, so that it is possible to define the visually detectable characters by full thickness zones.

The embodiments provided with their individual characteristics disclosed in connection with specific examples in practice can be interchanged with other different characteristics provided in the other embodiments.

Furthermore, it is understood that anything what will appear to be part of the prior art during the examining procedure of this patent application is hereby disclaimed and removed from the claims.

In practice, the used materials, as well as the dimensions and the forms could be varied according to the different needs.

In particular, the metallic layer 3 may be made of a noble metal, aluminium, chrome, nickel, copper or a combination thereof. Preferably, the noble metal is gold.

**CLAIMS**

1. Security element (1) for documents in general, in particular banknotes, security cards and the like, comprising a support layer (2) having, at least on one face, a continuous layer of metallic material (3), characterised in that said continuous layer of metallic material (3) comprises at least one zone (10) having a reduced thickness of metal with respect to surrounding portions so as to be visually distinctive from the surrounding portions or vice versa.

2. Security element (1) according to claim 1, characterised in that said at least one zone (10) has a thickness of metal lower than 70% and greater than 25% of the thickness of the layer of metallic material (3) of the surrounding portions.

3. Security element (1) according to any one of the previous claims, characterised in that said metallic layer (3) is made of a noble metal, aluminium, chrome, nickel, copper or a combination thereof.

4. Security element (1) according to claim 3, characterised in that said noble metal is gold.

5. Security element (1) according to one or more of the previous claims, characterised in that said metallic layer (3) has a thickness lower than 2.2 Optical Density.

6. Method for manufacturing a security element (1) for documents in general and in particular banknotes, security cards and the like according to claim 1, characterised in that the method comprises the steps of

metallizing at least one face of a polyester support layer (2),

applying a printed layer of ink thereon to protect said metallic layer (3),

demetallizing the tape in a tank containing 47-48% phosphoric acid with a temperature of 40°C +/- 2 for a period of 40-45 seconds,

washing with a buffer solution made of water and ammonia, and

rinsing the obtained product.

7. Method according to previous claim, characterised in that the method comprises steps of drying the film by means of wringing and of passing it in a hot air tunnel with a speed of 40 meters per minute at a temperature of 90-100°C with a permanence time of substantially 10 seconds.

8. Method according to the previous claims, characterised by a step of providing a corona treatment on the metallic layer (3) for anchoring the ink to be printed.

9. Method for manufacturing a security element (1) for documents in general and in particular banknotes, security cards and the like, characterised in that the method comprises the steps of

metallizing a polyester support layer (2),

carrying out on the produced metallic layer (3) a printing with cellulosic inks,

carrying out a demetallization with 54-56% phosphoric acid at a temperature of 55°C+/-2 for a time of 50-55 seconds,

washing the obtained product with water and ammonia,

rinsing, and

applying by means of an operation of a full bottom metallization a metallic layer with a thickness lower than the already present layer.

10. Document in general, characterised in that it comprises a wholly inserted security element (1) according to the previous claims.

11. Document in general according to one or more of the previous claims, characterised in that it comprises at least one partially inserted security element (1) according to the previous claims.

12. Document in general, characterised in that it is provided on one of its external faces with a security element (1) according to the previous claims.

13. Security element (1) according to claim 1, characterised in that also the layer of metallic material (3) in the at least one zone (10) having the reduced layer thickness is continuously formed.

14. Security element (1) according to one or more of the previous claims, characterised in that the support layer (2) is flexible.

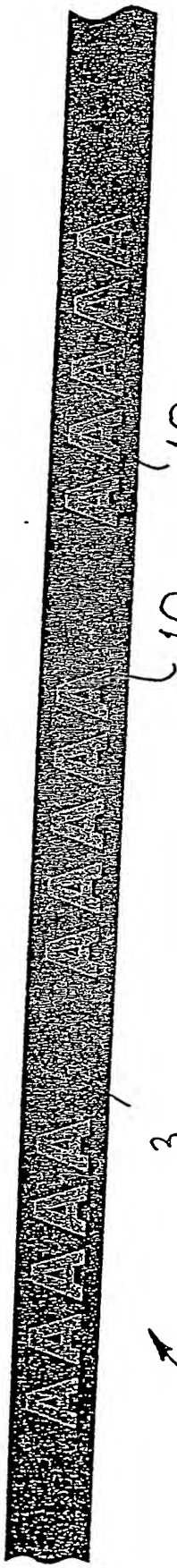



Fig. 1

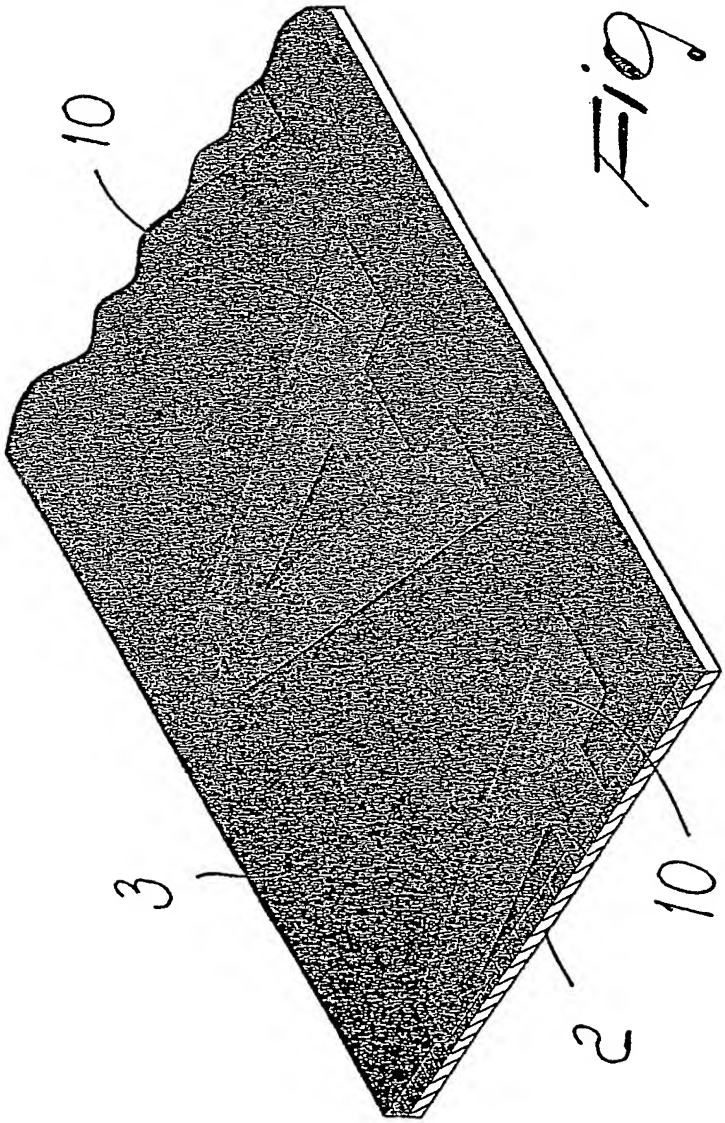



Fig. 2

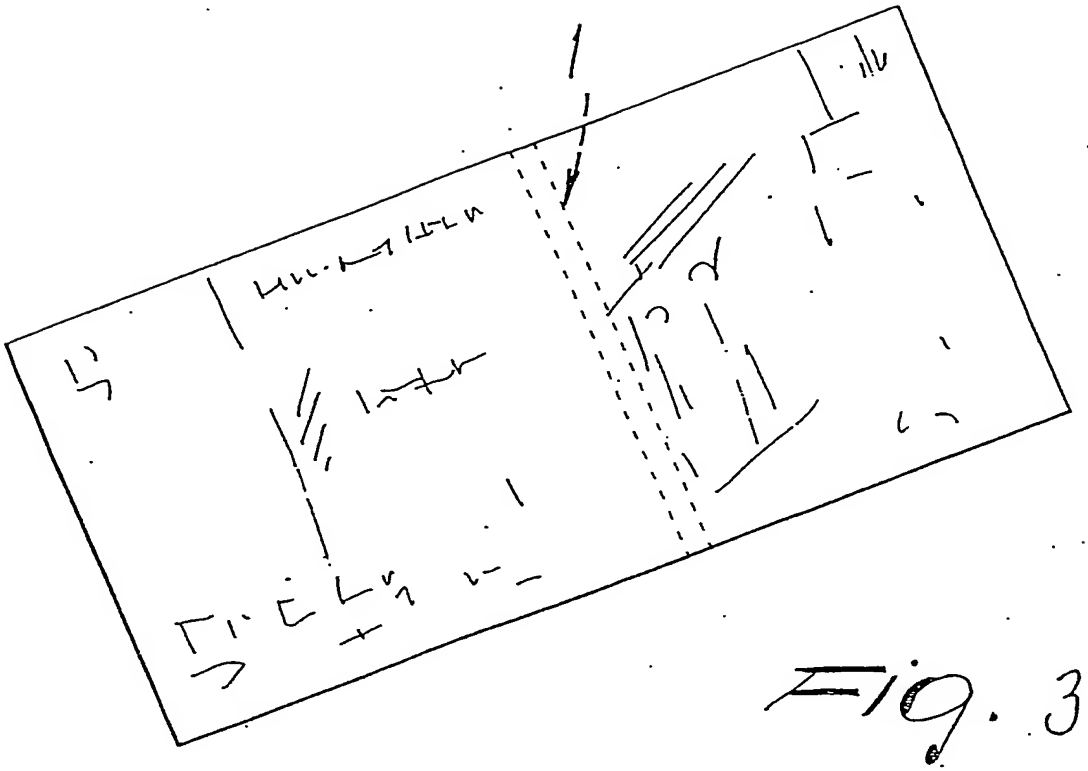



Fig. 3

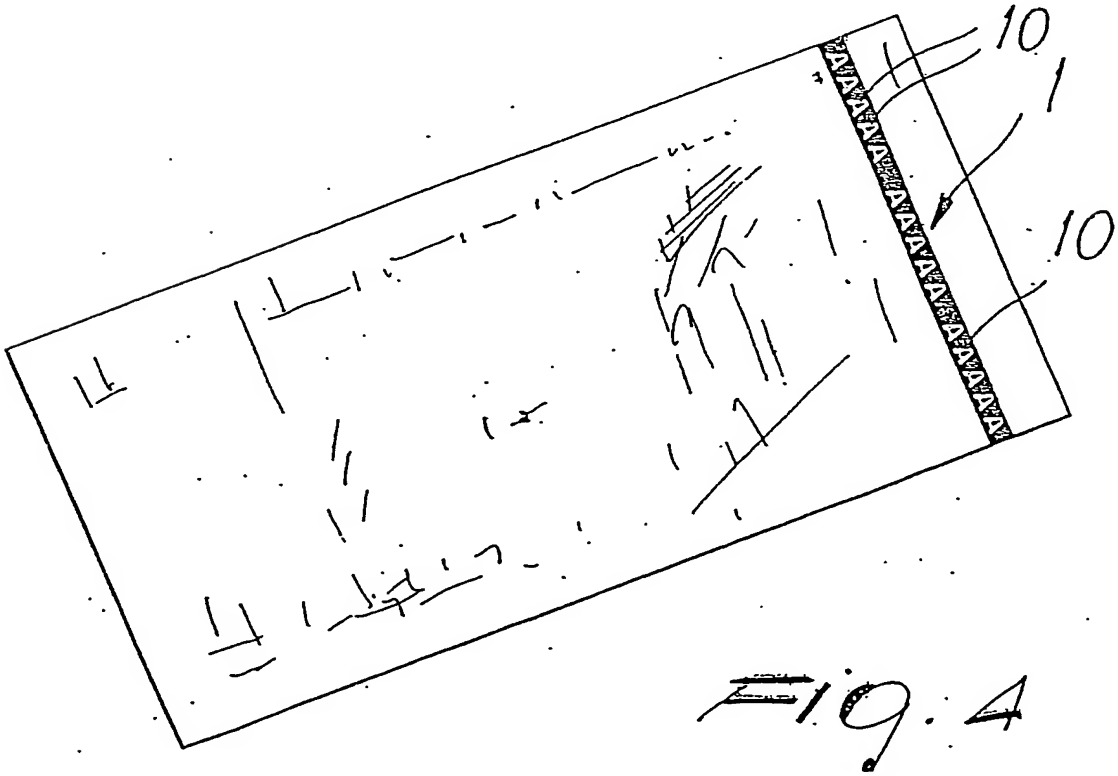



Fig. 4

# INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 02/11177

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B42D15/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B42D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
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☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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| Date of the actual completion of the international search | Date of mailing of the international search report |
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